

EXHIBIT 9

Sodium Azide

Sodium Azide is a colorless, explosive, and highly toxic salt that is soluble in water.

Laboratory Uses

Sodium azide is used as a source of azide anion which is a strong **nucleophile** that readily displaces suitable leaving groups. Azide functionalized molecules can undergo a number of transformations including copper-catalyzed [2+3] cyclocondensation with terminal **alkynes** and the *Staudinger Reaction*. Sodium azide is also commonly used as a preservative in many biochemical solutions.

Safety and Hazards

Explosion Hazard

Sodium azide is explosive and should be handled gently. Care should be taken to avoid grinding crystals trapped in ground glass joints and the threads of jars and bottles. It can also form highly explosive salts with many transition metals. This is of particular concern in one-step reactions involving *in situ* azide synthesis followed by a Huisgen 1,3-dipolar cycloaddition. Common reagents are both sodium azide and copper, from which highly explosive and shock sensitive copper azides can be produced.

Toxicity Hazard

Sodium azide is a potent toxin, possessing toxicity similar to that of cyanide. Like cyanide it functions by tightly binding the iron in heme cofactors. Solutions of sodium azide can be absorbed through the skin and mucous membranes.

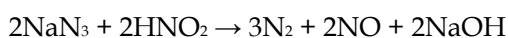
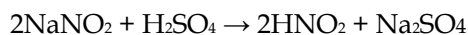
Other Hazards

The azide ion can react with acids to form the extremely explosive, volatile, and toxic hydrazoic acid. Take care to avoid acidifying mixtures containing sodium azide.

Halogenated solvents such as dichloromethane and chloroform can form extremely explosive di- and triazidomethanes with sodium azide. See this Organic Process Research & Development article for details of a diazidomethane explosion: <http://pubs.acs.org/doi/abs/10.1021/op8000977>.

Quenching

Excess azide represents a health and safety hazard and should be quenched before disposal. For a detailed description of how to quench sodium azide see the Health and Safety provided by Northeastern University: http://www.ehs.neu.edu/hazardous_waste/fact_sheets/sodium_azide/. It can be quenched by nitrous acid



This operation should only be carried out in a functioning fume hood using a vessel with a gas outlet

1. In a three-neck flask with a stirrer, dilute the azide with water so that it does not exceed 5%
2. With stirring add a 20% solution of sodium nitrite containing 1.5 g of sodium nitrite per gram of azide

3. Using a dropping addition funnel, add 20% H_2SO_4 until gas evolution has ceased and the solution is acidic by test paper

Iodine-starch paper can be used to test for an excess of nitrite which indicates that the quench is complete. Dispose of the solution as you would other aqueous waste.

Contributors

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